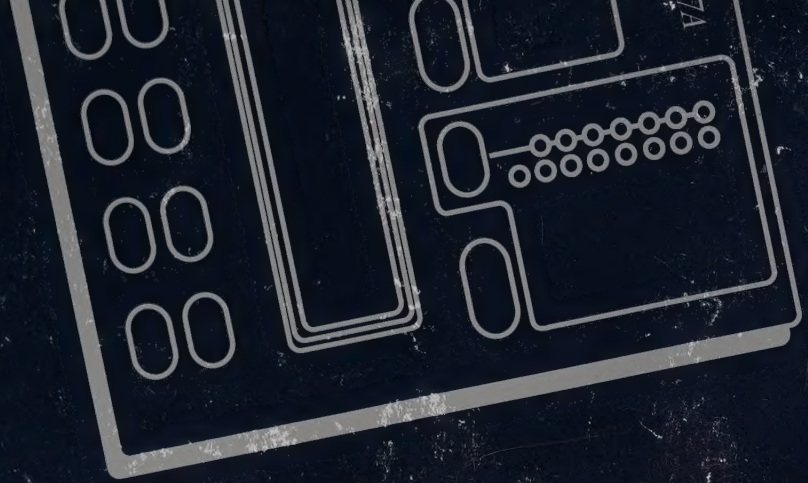

T-Carrier Analyzer User's Guide

T-BERD 107A

ITC

A Dynatech Company

50-12742-01
Rev. C

T-BERD 107A
T-CARRIER ANALYZER

USER'S GUIDE

DECEMBER 1994

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TABLE OF CONTENTS

SECTION **PAGE**

INTRODUCTION 1

BASIC SETUPS

1. Connecting The T-BERD 107A at Mid-Span 3
2. Generating Printouts 10
3. Timed Test Setup 13

APPLICATIONS

TESTING T1 NETWORKS

4. In-Service Monitoring 17
5. Channel Monitor Testing 21
6. NIU Loopback Testing 27
7. MULTIPAT and BRIDGTAP Loopback Testing 32
8. CSU Emulation 38
9. Measuring T1 Timing Slips 44

TESTING SLC-96 CIRCUITS

10. Monitoring SLC Shelf Performance 47

FT1 TESTING

11. Monitoring FT1 Signal Performance ... 55

SMART NIU TESTING

12. Smart NIU Testing 61

INTELLIGENT NETWORK TESTING

13. Testing Intelligent Repeater Spans 65

SECTION ..... PAGE

APPENDIX A 79
APPENDIX B 81

FIGURES

1. Monitoring Signals at Mid-Span 4
2. Testing Toward the Central Office 7
3. Testing Toward the Customer Premises 9
4. In-Service Monitoring Setup 18
5. DS0 Channel Monitor Setup 23
6. NIU Loopback Testing Setup 27
7. Testing with MULTIPAT and BRIDGTAP 32
8. CSU Emulation Setup 39
9. Monitoring SLC Shelf Performance 48
10. Monitoring FT1 Performance 56
11. Smart NIU Testing Setup 61
12. Testing Intelligent Repeater Spans 66

INTRODUCTION

The *T-BERD 107A User's Guide* offers an easy, direct method to setup and operate the T-BERD 107A within your network. It presents the most often used test setups in complete and concise steps. Illustrations, helpful notes, and step-by-step procedures make this user's guide a unique aid for new and experienced users.

This user's guide is designed for the user who needs to know the basics about setting up and operating the T-BERD 107A in a short amount of time. If you are unfamiliar with the instrument, please refer to the *T-BERD 107A Reference Manual* for more detailed information. If you should require additional help, call TTC Customer Service at (800) 638-2049.

This manual contains applications for the following T-BERD 107A options. The options used are identified at the beginning of the application. One or more of the options may be used in a single application.

- SLC Datalink Decode Option
- Advanced Stress Patterns Option
- Enhanced ESF Option
- Intelligent Network Support Option
- Fractional T1 Option

This manual is organized into the following sections:

BASIC SETUPS — Describes setting up the T-BERD 107A to test T1 circuits, printout hard copies of test configurations and test results, and perform timed testing.

APPLICATIONS — Presents setup procedures and results interpretation for a number of T-BERD 107A applications. Each application identifies the test scenario, the purpose of the test, and the required accessories or options. The tests are grouped as follows:

- Testing T1 Networks
- Testing SLC-96™ Circuits
- FT1 Testing
- Smart NIU Testing
- Intelligent Network Testing

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BASIC SETUPS

Connecting the T-BERD 107A at Mid-Span

Generating Printouts

Timed Test Set Up

BASIC SETUPS

1. CONNECTING THE T-BERD 107A AT MID-SPAN

T-BERD T1 Repeater Extender Required

The following procedure enables the T-BERD 107A to test the span in either direction. Refer to the *T-BERD T1 Repeater Extender (Model 41157) Operating Manual* for more detailed configurations.

Figure 1 illustrates the T-BERD 107A monitoring the T1 signals at a mid-span repeater.

T-BERD 107A Test Setup

1. **Configure the T-BERD 107A switches:**

POWER	ON
MODE	AUTO
CATEGORY	SUMMARY
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	BRIDGE
RCVD	INTERNAL timing (LED OFF)
LBO	0

T-BERD T1 Repeater Extender Test Setup

1. **Remove the desired repeater from the repeater housing**

CAUTION! Removing the repeater will disable the selected T1 span line.

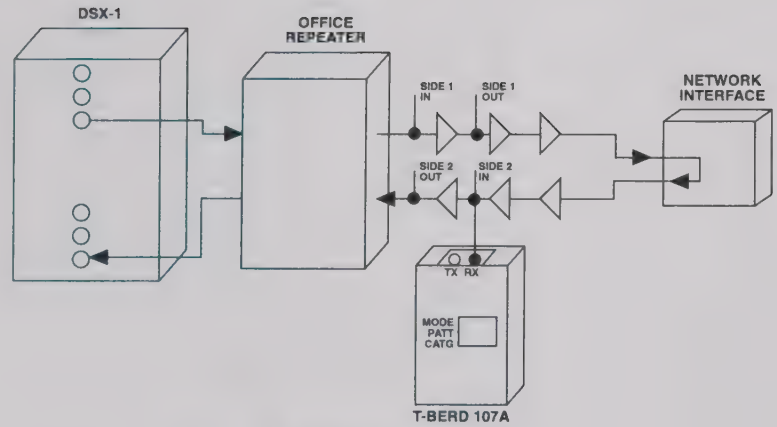


Figure 1
Monitoring Signals at Mid-Span

2. **Insert the T-BERD T1 Repeater Extender into the slot**

3. **Configure the T-BERD T1 Repeater Extender switches:**

TRANSMIT	THRU
SIGNAL PATH	THRU
CURRENT PATH	THRU
TEST	T1

4. **Insert the repeater into the T-BERD T1 Repeater Extender**

5. **Monitor the repeater input and output signals**

   Connect a bantam to WECO 310 cable from the T-BERD 107A RX jack to the T-BERD T1 Repeater Extender jacks in the sequence: SIDE 1 IN, SIDE 1 OUT, SIDE 2 IN, and SIDE 2 OUT. Note the location where the symptoms first appear.

CAUTION. High voltage may be encountered at the T1 REPEATER EXTENDER front-panel jacks when used on a working span. To prevent electrical shock, always plug test cables into the T-BERD 107A jacks before connecting to extender jacks. Always remove test cables from extender jacks before removing them from the T-BERD 107A jacks.

6. **Results interpretation**

   SIDE 1 IN jack errors — The problem is probably between the CO and the repeater. Use the *Testing Toward Central Office* procedure to prepare to test the T1 circuit.

SIDE 1 OUT jack errors — The problem is either the span between the repeater and the customer premises or the repeater. Use the *Testing Toward Customer Premises* procedure to prepare to test the T1 circuit.

SIDE 2 IN jack errors — The problem is probably between the repeater and the customer premises. Use the *Testing Toward Customer Premises* procedure to prepare to test the T1 circuit.

SIDE 2 OUT jack errors — The problem is either the span between the repeater and the CO or the repeater. Use the *Testing Toward Central Office* procedure to prepare to test the T1 circuit.

7 **Disconnect the cable from the T-BERD T1 Repeater Extender**

Testing Toward Central Office

Configure the T-BERD T1 Repeater Extender switches:

TRANSMIT	TX SIDE 2
SIGNAL PATH	THRU
CURRENT PATH	THRU
TEST	T1

Connect the T-BERD 107A to the T1 circuit
Connect a bantam to WECO 310 cable from the T-BERD 107A RX jack to the T-BERD T1 Repeater Extender SIDE 1 IN jack (see

Figure 2). Connect a bantam to WECO 310 cable from the T-BERD 107A TX jack to the T-BERD T1 Repeater Extender TRANSMIT jack (see Figure 2).

CAUTION. High voltage may be encountered at the T1 REPEATER EXTENDER front-panel jacks when used on a working span. To prevent electrical shock, always plug test cables into the T-BERD 107A jacks before connecting to extender jacks. Always remove test cables from extender jacks before removing them from the T-BERD 107A jacks.

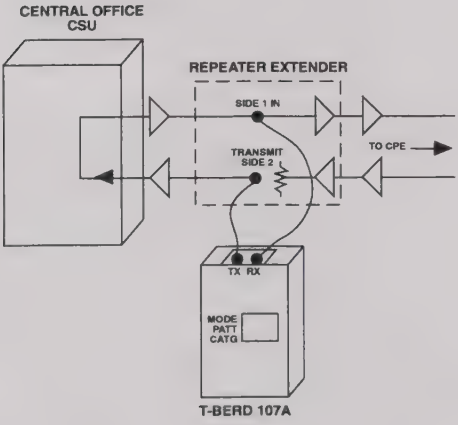


Figure 2
Testing Toward the Central Office

3. **Proceed to a specific test in *Applications***

Testing Toward Customer Premises

1. **Configure the T-BERD T1 Repeater Extender switches:**

TRANSMIT	TX SIDE 1
SIGNAL PATH	THRU
CURRENT PATH	THRU
TEST	T1

2. **Connect the T-BERD 107A to the T1 circuit**
   Connect a bantam to WECO 310 cable from the T-BERD 107A RX jack to the T-BERD T1 Repeater Extender SIDE 2 IN jack (see Figure 3). Connect a bantam to WECO 310 cable from the T-BERD 107A TX jack to the T-BERD T1 Repeater Extender TRANSMIT jack (see Figure 3).

CAUTION: High voltage may be encountered at the T1 REPEATER EXTENDER front-panel jacks when used on a working span. To prevent electrical shock, always plug test cables into the T-BERD 107A jacks before connecting to extender jacks. Always remove test cables from extender jacks before removing them from the T-BERD 107A jacks.

3. **Proceed to a specific test in *Applications***

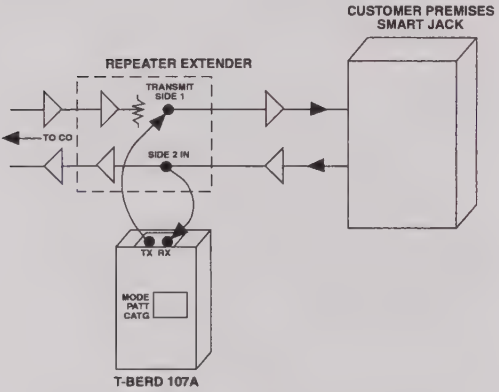


Figure 3
Testing Toward the Customer Premises

2. GENERATING PRINTOUTS

TTC PR-40A Thermal Printer or Equivalent Required

Use the following information to configure the T-BERD 107A and a compatible printer, such as the TTC PR-40A Thermal Printer, to generate results and controls printouts. Verify that the DIP switches on the PR-40A Thermal Printer agree with the default positions indicated on the label on the bottom of the printer (refer to the printer operating manual for operating procedures).

1. **Power on the T-BERD 107A**

2. **AUX switch**

   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

3. **PATTERN, CATEGORY, and RESULTS switches**

   Select the AUX PRNTPORT function. Press the **CATEGORY** switch to select BAUD RATE and press the **RESULTS** switch to select either 300, 1200, 2400, 4800, or 9600.

   Press the **CATEGORY** switch to select PARITY and press the **RESULTS** switch to select either EVEN PARITY, ODD PARITY, or NO PARITY.

   Press the **CATEGORY** switch to select TERM 232 and press the **RESULTS** switch to select either CR or CRLF.

4. **AUX switch**
   Press to extinguish the LED. The character display should return to the previous operating mode.

5. **Power off the T-BERD 107A**
   Press the **POWER** switch down and release. The switch should return to the upright, OFF position.

6. **Connect the printer to the T-BERD 107A**
   Connect a circular 8-pin DIN-type to 25-pin D-type connector cable (Model #30758) between the printer and the T-BERD 107A PRINTER connector.

7. **Turn the T-BERD 107A on first, then the PR-40A**

NOTE: When connecting a compatible printer other than the PR-40A to the T-BERD 107A, connect the printer to the T-BERD 107A, turn the printer power on first, and place the printer OFF LINE before turning on the T-BERD 107A.

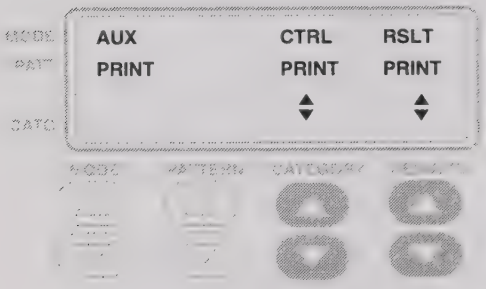
8. **Place the printer ON LINE**

NOTE: When the printer is placed ON LINE the T-BERD 107A immediately sends any printouts that are stored in memory.

9. **AUX switch**
   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

10 **PATTERN switch**

To manually initiate a printout, select the AUX PRINT function. Press the **CATEGORY** switch to generate a controls printout or press the **RESULTS** switch to generate a results printout.



To set the automatic print feature, select the AUX PRIEVNT function. Press the **RESULTS** switch to select OFF, TIMED, or ERROR.

11. **AUX switch**

Press to extinguish the LED. The character display should return to the previous operating mode.

3. TIMED TEST SETUP

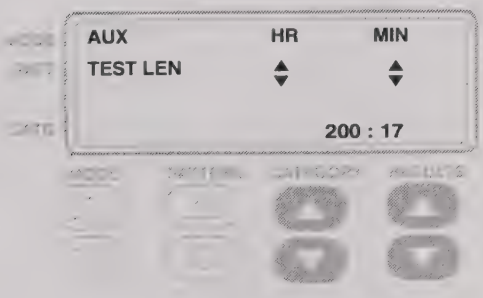
Perform the following procedure to prepare the T-BERD 107A to conduct an unattended test for an extended period and collect test results during and after the test. Specific results printouts are generated during the test by selecting the desired print event condition with the AUX PRI EVNT function.

1. **Connect the printer to the T-BERD 107A**
   Refer to Basic Setups Procedure 2, Generating Printouts, to connect a printer.

2. **AUX switch**
   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

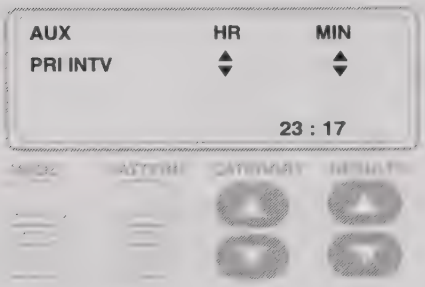
3. **PATTERN switch**
   Select the AUX TIME TST function. Press the **RESULTS** switch to select TIMED.

   Select the AUX TEST LEN function. Press the **CATEGORY** switch to set the hours (HR) and press the **RESULTS** switch to set the minutes (MIN).



Select the AUX PRI EVNT function. Press the **RESULTS** switch to select TIMED or ERROR.

If the AUX PRI EVNT function is set to TIMED, select the AUX PRI INTV function to set the periodic print interval. Press the **CATEGORY** switch to set the hours (HR) and press the **RESULTS** switch to set the minutes (MIN).



AUX switch

Press to extinguish the LED. The character display should return to the previous operating mode.

CATEGORY and RESULTS switches

Select the TIME category TEST END IN result. When the RESULTS display reaches 000:00:00, the test is complete, the test result counts are frozen, and *TIMED TEST COMPLETE* flashes in the character display until the **RESULTS** switch is pressed.

APPLICATIONS

This section provides information on operating the T-BERD 107A in a variety of common test applications. Each application describes how to configure the T-BERD 107A mainframe, connect to the circuit being tested, and interpret the test results. If an option is required, the option is indicated in the title of the application. The test scenarios and instrument setups are grouped into the following applications:

Testing T1 Networks

Testing SLC-96 Circuits

Monitoring FT1 Signal Performance

Smart NIU Testing

Testing Intelligent Repeater Spans

TESTING T1 NETWORKS

In-Service Monitoring

Channel Monitor Testing

NIU Loopback Testing

MULTIPAT and BRIDGTAP Loopback Testing

CSU Emulation

Measuring T1 Timing Slips

TESTING T1 NETWORKS

4. IN-SERVICE MONITORING

- Monitors the T1 facility without service interruption.
- Confirms that the T1 signal is properly received by the network equipment.
- Monitors the T1 signal for BPVs, frame errors, and CRC errors (ESF framing only).
- Measures the T1 signal level and frequency.

Figure 4 illustrates the T-BERD 107A monitoring the T1 signals at a DSX-1 monitor access point.

1 **Configure the T-BERD 107A switches:**

POWER	ON
MODE	AUTO
CATEGORY	SUMMARY
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	DSX-MON

2 **AUX switch**

Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

PATTERN switch

Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

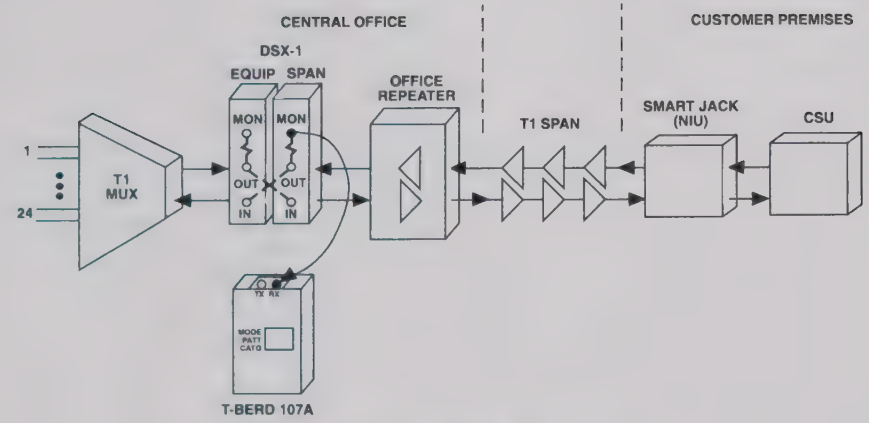
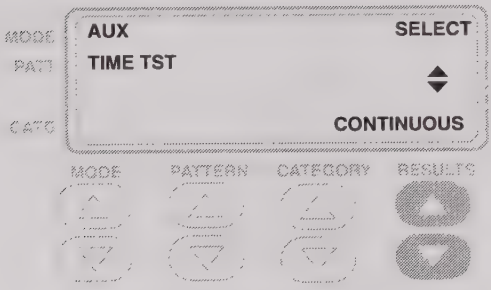


Figure 3
In-service Monitoring Setup



4 **AUX switch**

Press to extinguish the LED. The character display should return to the previous operating mode.

5 **Connect the T-BERD 107A to the T1 circuit**

Connect a cable from the RX jack to the span-side DSX-1 MON jack.

6 **Press the RESTART switch**

7 **Status LEDs**

Verify that these LEDs illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable).

8 **CATEGORY and RESULTS switches**

Select the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, observe the SUMMARY category results. Check the other categories as required.

9. **Results interpretation**

VIOLATIONS only

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a span line problem between you and the last piece of transmission equipment that framed the signal.

RX FREQ, Hz

The DS1 received frequency should be 1.544 MHz ±77 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

RX LEVEL (dBdsx)

The received level should be -20 dBdsx ±3.5 dBdsx at resistor isolated DSX-1 MON jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

Yellow Alarm LED

This alarm LED indicates a problem in the transmission leg of the span.

10. **Remove the test cable from the DSX-1 MON jack**

5. CHANNEL MONITOR TESTING

- Display signaling and data bits of a user-selected DS0 channel.
- Monitor a DS0 channel.
- Drop a selected channel to an external test set.

Figure 5 illustrates the T-BERD 107A monitoring the DS0 signaling and data bits at a DSX-1 monitor access point.

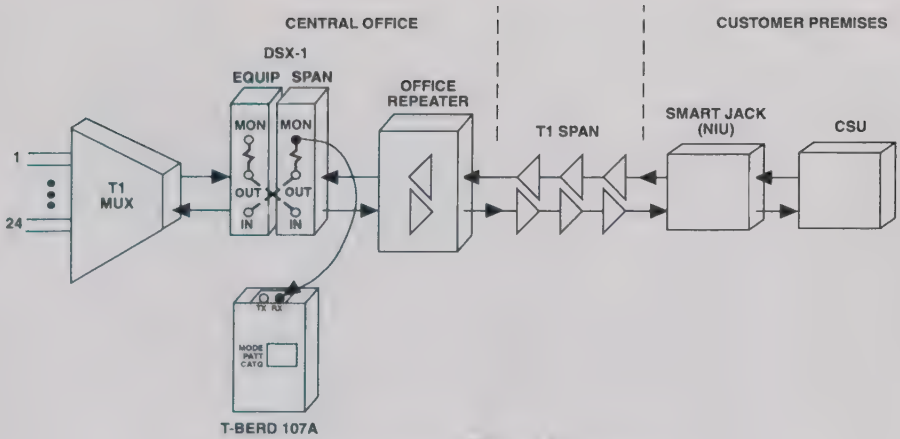
NOTE The T-BERD 107A actually selects a DS0 time slot from the received signal. Therefore, T1 D1D and SLC channel numbers do not correspond to the displayed channel number. Refer to the Channel Time Slot Assignments Table in Appendix A to determine the actual channel number being displayed.

1 **Configure the T-BERD 107A switches:**

POWER	ON
MODE	AUTO
CATEGORY	SUMMARY
RCVD	RECOVERED (LED ON)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	DSX-MON

2 **AUX switch**

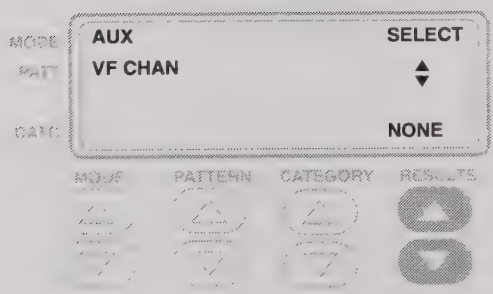
Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.


CENTRAL OFFICE
DSX-1
EQUIP SPAN
MON
MON
OUT
OUT
IN
IN
1
24
T1 MUX
OFFICE REPEATER
T1 SPAN
CUSTOMER PREMISES
SMART JACK (NIU)
CSU
TX RX
MODE PATT CATG
T-BERD 107A

3. **PATTERN switch**

Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

Select the AUX VF CHAN function. Press the **RESULTS** switch to choose the channel to be dropped.



Select the AUX VOLUME function. Press the **RESULTS** switch to set the volume to mid-range (half the boxes filled).

4. **AUX switch**

Press to extinguish the LED. The character display should return to the previous operating mode.

5. **T1 circuit connection**

Connect a cable from the RX jack to the DSX-1 MON jack.

6. **Press the RESTART switch to clear spurious alarms**

Signal verification

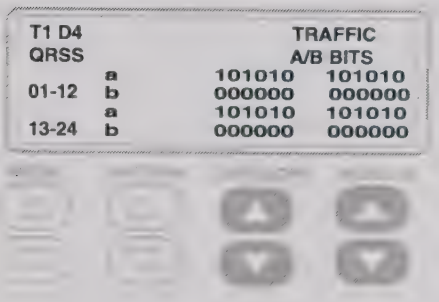
These LEDs should illuminate: T1 Pulses, Pattern Sync (if applicable), Frame Sync, and B8ZS (if applicable).

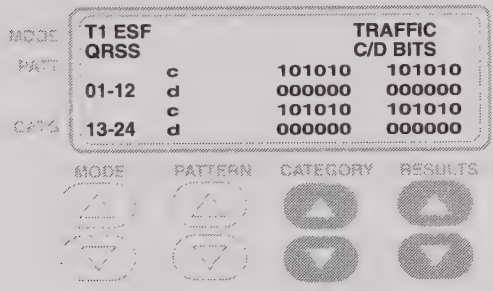
CATEGORY and RESULTS switches

Select the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, observe the SUMMARY category results. Check the other categories as required.

CATEGORY and RESULTS switches

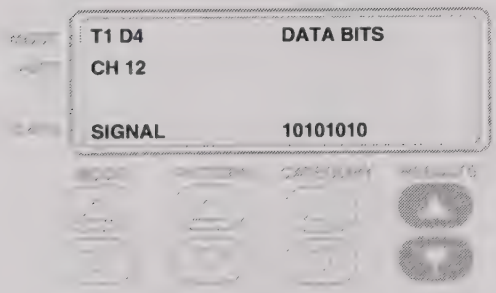
Select the SIGNAL category TRAFFIC result. For T1 D1D, T1 D4, and T1 SLC, only A and B signaling bits are displayed. For ESF framing A and B, or C and D signaling bits can be displayed. Listen for an audible tone from the speaker.



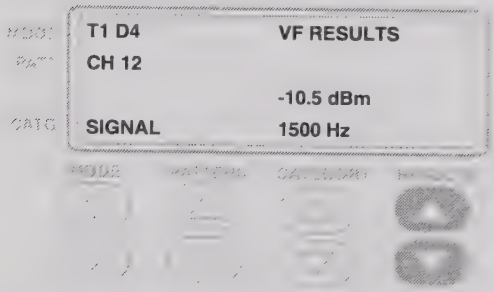


The TRAFFIC display verifies proper handshaking between the transmission equipment for off hook, on hook, and ring sequences (see Appendix B Trunk Type Summary).

Select DATA BITS. The DATA BITS display shows sampled data from the selected timeslot. An idle channel displays all ones. For live traffic at data rates of 56 kb/s and below, the eighth bit is always one.



Select VF RESULTS. The selected channel's VF level and frequency are displayed. If the frequency is 0 Hz, there is no continuity between you and the last piece of transmission equipment. Inaccurate frequency or level results typically indicate faulty cabling or a bad VF card.



10. **PATTERN switch**

For the DATA BITS and VF RESULTS test results, press the **PATTERN** switch to change the selected channel. This automatically supercedes the AUX CH DROP function selection for the channel that is dropped to the speaker and VF OUT jack, as well as changing the displayed channel.

11. **VF OUT jack**

Connect a TIMS test set to the VF OUT jack to perform additional testing and analysis on the selected DS0 channel.

12. **Circuit disconnect**

Once you have completed the test, remove the cable from the DSX-1 MON jack and turn off the T-BERD 107A.

6. NIU LOOPBACK TESTING

- Tests for logic errors, BPVs, frame errors, and CRC errors (ESF-framing only).
- Checks loopback response of transmission equipment.
- NIU loopback isolates the network from customer premises equipment for trouble-shooting.

Figure 6 illustrates the T-BERD 107A testing a T1 span that is looped back at the NIU.

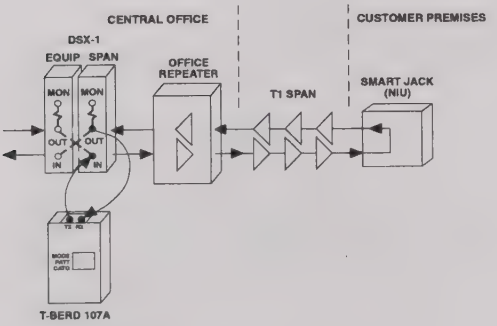


Figure 6
NIU Loopback Testing Setup

Configure the T-BERD 107A switches:

POWER	ON
MODE	Select appropriate T1 framing
PATTERN	Select the appropriate test pattern
CATEGORY	SUMMARY
RCVD	INTERNAL (LED OFF)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	TERM
LBO	0
LOOP CODES	NIU

AUX switch

Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

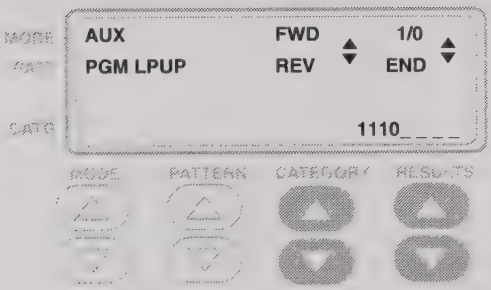
PATTERN switch

Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

If intending to loop back the NIU with one of the standard loop codes, select the AUX LOOPCODE (NIU) function. Press the **RESULTS** switch to select the appropriate loop code (FAC1, FAC2, FAC3, or ESF NET).

If intending to send programmable loop codes, press the **LOOP CODES** switch to select PROG. Select the AUX LOOPCODE (PROG) function and press the **CATEGORY** switch to select USER. Then, select the AUX PGM LPUP and AUX PGM LPDN functions.

To program each loop code, press the **CATEGORY** switch to move the cursor to each bit and press the **RESULTS** switch up arrow to toggle the bit to the desired value. Press the **RESULTS** switch down arrow to end the loop code at the flashing bit; all bits to the right of the flashing bit are dropped from the loop code.



If the T1 circuit uses ESF framing, press the **LOOP CODES** switch to select CSU. Then, select the AUX LOOPCODE (CSU) function. Press the **RESULTS** switch to select either IN BAND, ESF LINE, or ESF PAYLOAD.

AUX switch

Press to extinguish the LED. The character display should return to the previous operating mode.

Connect the T-BERD 107A to the T1 circuit

Connect a cable from the RX jack to the span-side (EAST) DSX-1 OUT jack. Connect a cable from the TX jack to the span-side (EAST) DSX-1 IN jack (see Figure 6).

9. **Press the LOOP UP switch**
   Observe the switch LED illuminates and remains illuminated until the loopback is established.

10. **Press the RESTART switch to clear spurious alarms**

11. **Status LEDs**
    Verify these LEDs illuminate: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS (if applicable).

12. **ERR INS switch and RESULTS display**
    Press this switch several times and observe that *BIT ERRORS* and *VIOLATIONS* appear in the RESULTS display. If not, the loopback has not been established. Sectionalize the T1 span.

NOTE: Possible causes for loopback failure are the NIU/CSU not operating correctly, the span between the T-BERD 107A and NIU/CSU is bad, or the loop code is wrong.

13. **Press the RESTART switch to begin the test**

14. **CATEGORY and RESULTS switches**
    Select the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, observe the SUMMARY category results. Check the other categories as required.

12. **Results interpretation**

BIT ERRORS only

Check the span before the DSX-1 by isolating sections and testing.

VIOLATIONS only

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

BIT ERRORS and VIOLATIONS

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

RX FREQ, Hz

The DS1 received frequency should be 1.544 MHz ±77 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

RX LEVEL (dBdsx)

The received level should be +4 to -4 dBdsx at the terminated DSX-1 OUT jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

11. **Press the LOOP DOWN switch**

The switch LED remains illuminated until the loopback is removed.

Disconnect the cables from the T1 circuit

Remove the cables from the DSX-1 OUT jack and DSX-1 IN jack. Then, remove the cables from the RX and TX jacks.

7. MULTIPAT AND BRIDGTAP LOOPBACK TESTING

MULTIPAT™

- Automated series of five test patterns (ALL ONES, 1:7, 2 IN 8, 3 IN 24, and QRSS) performs a one-step qualification of T1 span lines.
- The AUX MULTIPAT function determines the test duration for each of the five test patterns.

BRIDGTAP™

- Automated series of 21 test patterns detects the presence of most bridge taps on T1 span lines.
- The 21 test patterns are composed of varying degrees of ones and zeros densities.

Figure 7 illustrates the T-BERD 107A performing stress pattern tests on a T1 span that is looped back at the NIU.

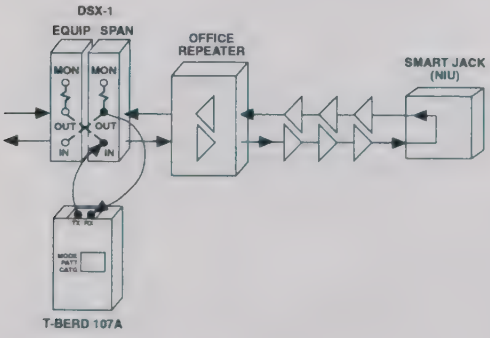


Figure 7
Testing with MULTIPAT and BRIDGTAP

1. **Set the T-BERD 107A switches to the following positions:**

POWER	ON
MODE	Select appropriate T1 framing
PATTERN	MULTIPAT first, then BRIDGTAP
CATEGORY	SUMMARY
RCVD	INTERNAL (LED OFF)
B8ZS	B8ZS (MULTIPAT only) or AMI (MULTIPAT or BRIDGTAP)
RX INPUT	TERM
LBO	0
LOOP CODES	NIU

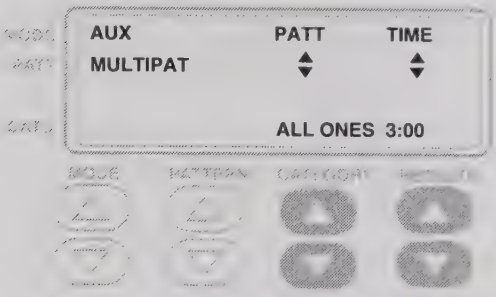
2. **AUX switch**

   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

3. **PATTERN switch**

   Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

   Select the AUX MULTIPAT function. Press the **CATEGORY** switch to select the pattern to be changed. Press the **RESULTS** switch to set the duration for the selected pattern (0:00 turns the selected pattern off).



If intending to loop back the NIU with one of the standard loop codes, select the AUX LOOPCODE (NIU) function. Press the **RESULTS** switch to select the appropriate loop code (FAC1, FAC2, FAC3, or ESF NET).

If intending to send programmable loop codes, press the **LOOP CODES** switch to select PROG. Select the AUX LOOPCODE (PROG) function and press the **CATEGORY** switch to select USER. Then, select the AUX PGM LPUP and AUX PGM LPDN functions. To program each loop code, press the **CATEGORY** switch to move the cursor to each bit and press the **RESULTS** switch up arrow to toggle the bit to the desired value. Press the **RESULTS** switch down arrow to end the loop code at the flashing bit; all bits to the right of the flashing bit are dropped from the loop code.

If the T1 circuit uses ESF framing, press the **LOOP CODES** switch to select CSU. Then, select the AUX LOOPCODE (CSU) function. Press the **RESULTS** switch to select either IN BAND, ESF LINE, or ESF PAYLOAD.

4. **AUX switch**
   Press to extinguish the LED. The character display should return to the previous operating mode.

5. **T1 circuit connection (DSX-1 Application)**
   Connect a cable from the RX jack to the span-side (EAST) DSX-1 OUT jack. Connect a cable from the TX jack to the span-side (EAST) DSX-1 IN jack (see Figure 3).

6. **Press the RESTART switch to clear spurious alarms**

7. **Press the LOOP UP switch**
   The switch LED remains illuminated until the loopback is established.

8. **Status LEDs**
   These LEDs should illuminate: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS (if applicable).

9. **ERR INS switch**
   Press this switch several times and observe that *BIT ERRORS* and *VIOLATIONS* scroll in the RESULTS display. If not, the loopback has not been established. Sectionalize the span further.

10. Possible causes for loopback failure are the NIU not operating correctly, the span between the T-BERD 107A and NIU is bad, or the loop code is wrong.

10 **Press the RESTART switch to start the test**

11 **Results interpretation — SUMMARY category**

ALL RESULTS OK

No errors were detected with the MULTIPAT and BRIDGTAP test.

FAILED MULTIPAT PATTERNS

If 3 IN 24 failed, it indicates a bad repeater (timing circuit) or one side of span is open.

If ALL ONES failed, it indicates a bad repeater (power output).

If 1:7 failed, it indicates a bad repeater (timing circuit) or one side of span is open.

If QRSS failed, it indicates a faulty cable.

Errored Results — MULTIPAT Errors

When all or part of the patterns fails, it generally indicates a malfunctioning repeater, multiplexer, or DSX. To determine the possible cause, repeat the individual failed pattern while monitoring the RESULTS display. If errors immediately start accumulating, there is a cabling problem. If no errors occur for a few minutes, and then a burst of errors occurs, the problem is a repeater.

Errored Results — BRIDGTAP Errors
When the errors are grouped around a number of patterns it indicates that a bridge tap exists on the span. Sectionalize the span to isolate the bridge tap.

12. **Press the LOOP DOWN switch**
The switch LED remains illuminated until the loopback is removed.

13. **Disconnect the cables from the T1 circuit**
Remove the cable from the DSX-1 OUT jack and DSX-1 IN jack. Then, remove the cables from the RX and TX jacks.

8. CSU EMULATION

- Verify the span installation.
- Terminate the T1 line and loop simplex current.
- Auto-respond to T1 loop codes.
- Functionally replace a CSU.

NOTE One CSU function is to complete the current path that powers the span repeaters. HAZARDOUS VOLTAGES EXIST ON THE LINE SIDE OF THE CSU. Local telephone company office alarms may sound when the current path is interrupted. Since telephone companies do not have a uniform policy regarding the disconnection of the CSU from the span, LOCAL TELEPHONE COMPANY INTERVENTION IS STRONGLY RECOMMENDED. Advance notice should be given, so that power can be removed from the span before disconnection of the CSU.

Figure 8 illustrates the T-BERD 107A emulating a CSU.

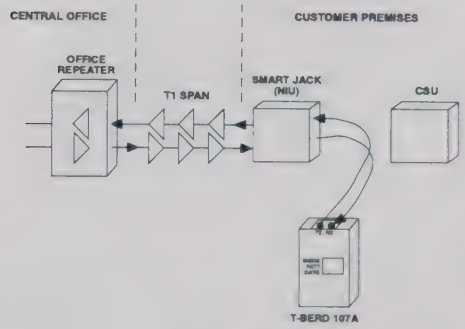


Figure 8
CSU Emulation Setup

1. **Configure the T-BERD 107A switches:**

POWER	ON
MODE	AUTO
RCVD	INTERNAL (LED OFF)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	TERM
CATEGORY	SIGNAL
RESULTS	RX LEVEL (dBdsx)
LOOP CODES	CSU (CSU LED illuminated)

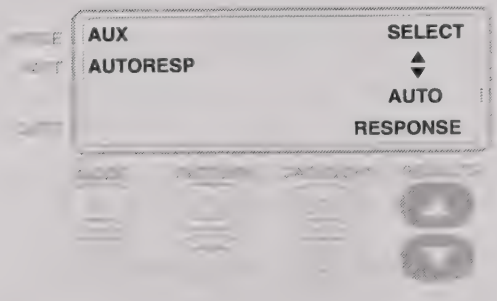
2. **AUX switch**

   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

3. **PATTERN switch**

   Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

   Select the AUX AUTORESP function. Press the **RESULTS** switch to set to AUTO RESPONSE.



Select the AUX LOOPCODE (CSU) function. Press the **RESULTS** switch to select either IN BAND, ESF LINE, or ESF PAYLOAD. The T-BERD 107A does not respond to ESF PAYLOAD loop codes.

If intending to receive programmable loop codes, press the **LOOP CODES** switch to select PROG. Select the AUX LOOPCODE (PROG) function and press the **CATEGORY** switch to select USER. Then, select the AUX PGM LPUP and AUX PGM LPDN functions. To program each loop code, press the **CATEGORY** switch to move the cursor to each bit and press the **RESULTS** switch up arrow to toggle the bit to the desired value. Press the **RESULTS** switch down arrow to end the loop code at the flashing bit; all bits to the right of the flashing bit are dropped from the loop code.

AUX switch

Press to extinguish the LED. The character display should return to the previous operating mode.

Central office repeater power supply

Disconnect the office repeater power supply from the span being tested.

High voltage may be encountered.

Disconnect the CSU

Once power has been removed, disconnect the CSU from the span line.

TX jack and RX jack connections

Connect cables from the T-BERD 107A jacks to the NIU.

8. **Restore power to the span line**

9. **LBO switch**

   If RX LEVEL is -15 dBdsx or below, set to 0 dB. If RX LEVEL is -14 to -8 dBdsx, set to -7.5 dB. If RX LEVEL is -7.5 dBdsx or above, set to -15 dB.

10. **Send the CSU loop-up code**

    Send the CSU loop-up code from the central office to the T-BERD 107A. The T-BERD 107A responds by establishing an AUTO LLB mode. This internally loops the receiver to the transmitter. The **LOOP UP** switch LED illuminates when the loop-up code is received. The **RCVD** switch LED illuminates when the T-BERD 107A enters the AUTO LLB mode. The test restarts when the loopback is established.

11. **Loopback and Status LEDs verification**

    Verify that the loopback was successfully established and these LEDs illuminate: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS (if applicable).

12. **CATEGORY and RESULTS switches**

    Select the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, observe the SUMMARY category results. Check the other categories as required.

13. **CATEGORY and RESULTS switches**

    Select the SIGNAL category SPX CURRENT result.

14. **Results interpretation**

VIOLATIONS only

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a span line problem between you and the last piece of transmission equipment that framed the signal.

VIOLATIONS and FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

RX FREQ, Hz

The DS1 received frequency should be 1.544 MHz ±77 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

RX LEVEL (dBdsx)

The received level should be -20 dBdsx ±3.5 dBdsx at resistor isolated DSX-1 MON jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

Yellow Alarm LED
This alarm LED indicates a problem in the transmission leg of the span.

Send the CSU loop-down code
Send the CSU loop-down code from the central office to the T-BERD 107A. The T-BERD 107A responds by releasing the AUTO LLB mode. The **LOOP DOWN** switch LED illuminates when the loop-down code is received. The **RCVD** switch LED is extinguished when the T-BERD 107A exits the AUTO LLB mode. This internally disconnects the receiver from the transmitter.

Disconnect the T-BERD 107A from the span

Central office repeater power supply
Disconnect the office repeater power supply from the span being tested.

WARNING High voltage may be encountered.

Reconnect the CSU
Once power has been removed, reconnect the CSU to the span line.

Restore power to the span line

9. MEASURING T1 TIMING SLIPS

- Confirm that all the network equipment is properly synchronized.

- Timing slips verify misoptioned equipment at the customer premises. The customer premises CSU should be set to recovered timing, not internal timing.

1. **Configure the T-BERD 107A switches:**

POWER	ON
MODE	AUTO
CATEGORY	SUMMARY
RCVD	RECOVERED (LED ON)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	DSX-MON

2. **AUX switch**
   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

3. **PATTERN switch**
   Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

4. **AUX switch**
   Press to extinguish the LED. The character display should return to the previous operating mode.

5 **T1 circuit connection**

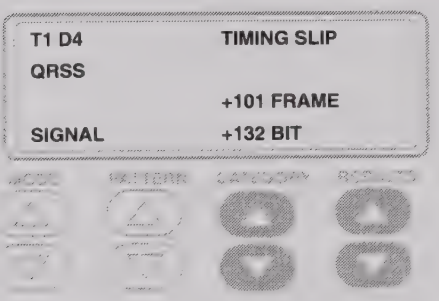
Connect a cable from the RX jack to the span-side DSX-1 MON jack. Connect a cable from the REF jack to the T1 timing reference (DSX-1 OUT jack or DSX-1 MON jack).

6 **Status LEDs**

These LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable).

7 **CATEGORY and RESULTS switches**

Select the SIGNAL category TIMING SLIP result.



8 **Press the RESTART switch to start the test**

9 **Results interpretation**

The results appear in the RESULTS display on the third and fourth lines, where frame slips (a number from -999 to +999) appear on the third line and bit slips (a number from -192 to +192) appear on the fourth line).

- If the REF and RX signals are synchronized, the timing slip count remains at zero.

- If the REF and RX signals are not synchronized, and the RX frequency is higher than the REF frequency, the results are positive.

- If the REF and RX signals are not synchronized, and the RX frequency is lower than the REF frequency, the results are negative.

- If the REF and RX signals are synchronized, but one signal contains wander, the timing slip count may increase and decrease through zero.

10. **Circuit disconnect**

    Remove the cable from the T1 timing reference (DSX-1 OUT jack or DSX-1 MON jack) and the span-side DSX-1 MON jack. Then, remove the cables from the RX and REF jacks.

TESTING SLC-96 CIRCUITS

Monitoring SLC Shelf Performance

TESTING SLC-96 CIRCUITS

10. MONITORING SLC SHELF PERFORMANCE

SLC Datalink Decode Option Required

- Perform long-term non-intrusive monitoring of the SLC shelf channel and datalink performance.

- Monitor the datalink traffic between the Central Office Switch (COS) or Central Office Terminal (COT) and the Remote Terminal (RT) for major, minor, and power/miscellaneous alarms, as well as switch to protect and automated maintenance test requests.

Figure 9 illustrates the T-BERD 107A using the SLC Datalink Decode Option to monitor the SLC Shelf A T1 channels and datalink from the DSX-1 access point.

Configure the T-BERD 107A switches:

POWER	ON
MODE	AUTO
CATEGORY	SUMMARY
RCVD	RECOVERED (LED ON)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	DSX-MON

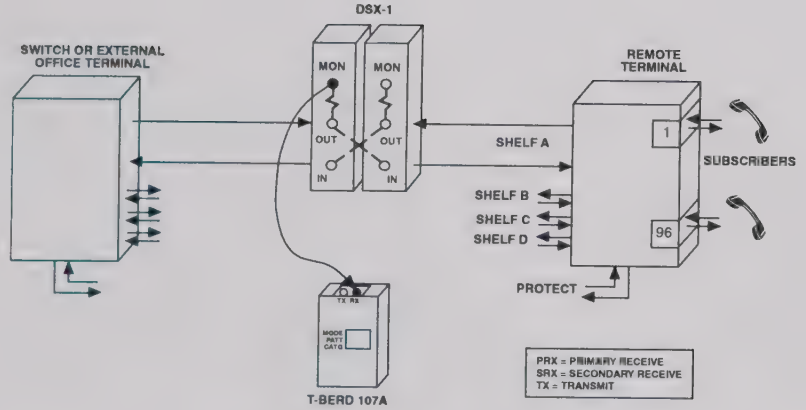


Figure 9
Monitoring DLC Shelf Performance

2. **AUX switch**

   Press to illuminate the LED. Verify that the character display changes to an auxiliary function display.

3. **PATTERN switch**

   Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

4. **AUX switch**

   Press to extinguish the LED. The character display should return to the previous operating mode.

5. **RX jack**

   Connect a cable between this jack and the T1 line as follows:

   - If at the CO, plug a cable between this jack and the Shelf A equipment-side DSX-1 MON jack.
   - If at the RT, plug a cable between this jack and the Shelf A span-side DSX-1 MON jack.

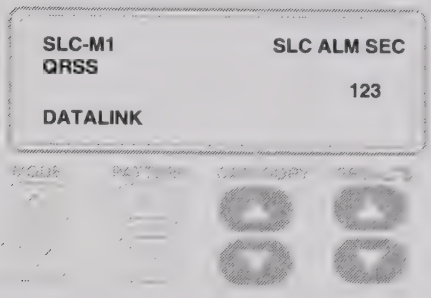
6. **Press the RESTART switch to clear spurious alarms**

7. **Status LEDs**

   These LEDs should illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable).

CATEGORY and RESULTS switches

Select the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, observe the SUMMARY category results and SLC datalink messages. Select the DATALINK category. Select the SLC ALM SEC and ALM FIELD test results. Check the other categories as required.



T1 signal results interpretation

VIOLATIONS only

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a span line problem between you and the last piece of transmission equipment that framed the signal.

VIOLATIONS and FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

RX FREQ, Hz

The DS1 received frequency should be 1.544 MHz ±77 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

RX LEVEL (dBdsx)

The received level should be -20 dBdsx ±3.5 dBdsx at resistor isolated DSX-1 MON jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

Yellow Alarm LED

This alarm LED indicates a problem in the transmission leg of the span.

SLC results interpretation

The following messages appear in the SUMMARY category while the condition exists. Once the condition is cleared, the messages appear in the DATALINK category as historical record of the event.

MAJOR ALARM SHELF x — This message is displayed when a major alarm is detected with an accompanying alarm on the indicated shelf (x = A, B, C, or D).

MAJOR ALARM NO SHELF — This message is displayed when a major alarm is detected without an accompanying shelf alarm.

ALARM SHELF x — This message is displayed when a shelf alarm condition exists on the indicated shelf (x = A, B, C, or D), and no associated Major Alarm is detected.

FE LOOP SHELF x — This message is displayed when a request is detected to the far end to loop shelf the indicated shelf (x = A, B, C, or D).

FE LOOP PROTECT — This message is displayed when a request is detected to the far end to loop the protection shelf.

SHELF x ON PROT — This message is displayed when the indicated shelf (x = A, B, C, or D) has been switched to the protection shelf. Three consecutive datalink frames must indicated that a shelf has been switched to the protection shelf before this alarm message is displayed.

MINOR ALARM — This message is displayed when a minor alarm condition is detected.

PWR/MISC ALARM — This message is displayed when a Power/Miscellaneous alarm condition is detected.

MAINT HOOK/SEIZE — This message is displayed when the *ON-HOOK* or *SEIZE RC* message is detected in the maintenance field. It indicates that either the line is being "released" at the end of the test or "seized" at the beginning of the test.

MAINT PROCEED — This message is displayed when the *PROCEED CR* or *PROCEED RC* message is detected in the maintenance field. It indicates that the system is ready to proceed with the test.

MAINT TEST ALARM — This message is displayed when the *TEST ALM CR* or *TEST ALM RC* message is detected in the maintenance field. It indicates an error has been detected in the maintenance test and the test should be aborted.

DATALINK SYNC LOSS — This message is displayed when SLC datalink synchronization has been lost. The display alternates between the *DATALINK SYNC LOSS* message and the selected test result until datalink synchronization returns. If the signal loss occurs at the same time, the *DATALINK SYNC LOSS* message is not displayed.

FT1 TESTING

Monitoring FT1 Signal Performance

11. MONITORING FT1 SIGNAL PERFORMANCE

Fractional T1 Option Required

- Non-intrusively monitor the FT1 facility.
- Confirm that the contiguous or non-contiguous FT1 signal is properly received by the network equipment.
- Monitor the FT1 signal for BPVs, frame errors, and CRC errors (ESF framing only).

Figure 10 illustrates the T-BERD 107A monitoring the T1 signals at a DSX-1 monitor access point.

1. **Configure the T-BERD 107A switches:**

POWER	ON
MODE	The appropriate FT1 mode
RCVD	RECOVERED (LED ON)
CATEGORY	SUMMARY
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	DSX-MON

2. **AUX switch**
   Press to illuminate the LED.

3. **PATTERN, CATEGORY, and RESULTS switches**
   Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

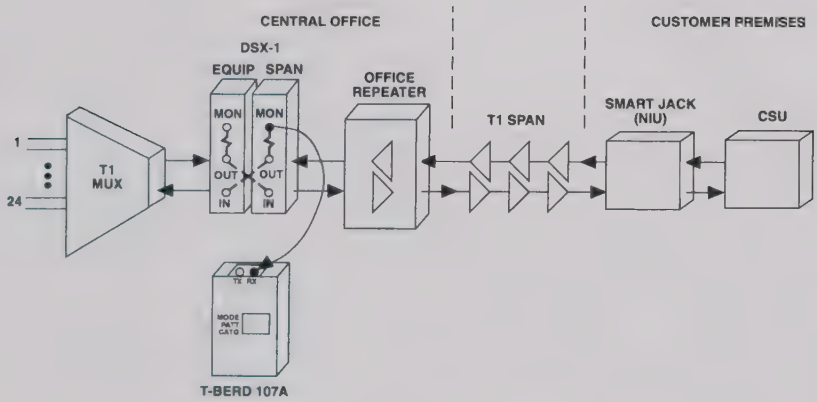
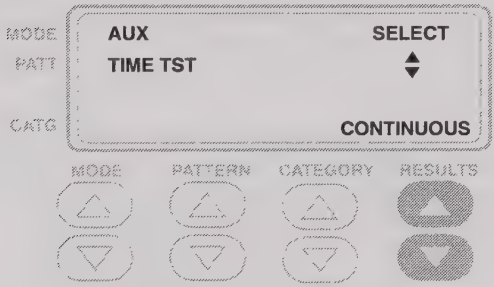
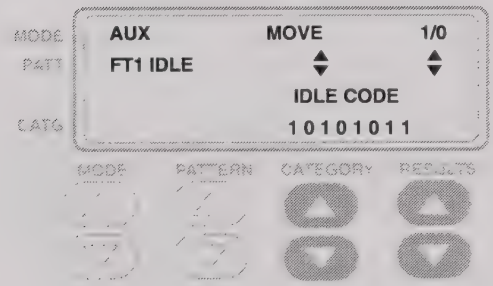


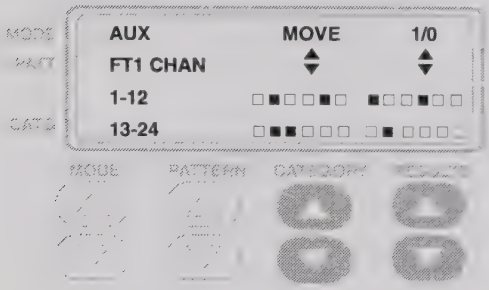
Figure 10
Monitoring T1 Performance



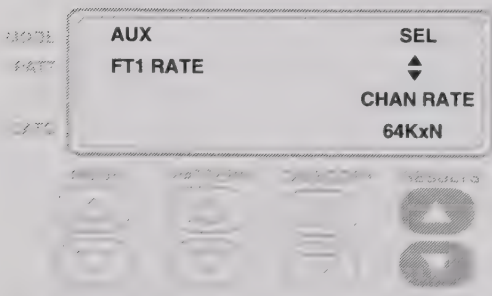
Select the AUX FT1 IDLE function. Press the **CATEGORY** switch to move the cursor. Press the **RESULTS** switch up arrow to set the selected bit to a one and the down arrow to set the selected bit to a zero. Pressing the **RESULTS** switch up or down arrow also moves the cursor one space to the right.



Select the AUX FT1 CHAN function. Press the **CATEGORY** switch to move the cursor. Press the **RESULTS** switch up arrow to select the highlighted channel and the down arrow to deselect the highlighted channel. Pressing the **RESULTS** switch up or down arrow also moves the cursor one space to the right.



Select the AUX FT1 RATE function. Press either **RESULTS** switch arrow to toggle the data rate between 64KxN and 56KxN. A data rate of 56KxN sets the least significant data bit to one within the FT1 channels.



AUX switch
Press to extinguish the LED.

Connect the T-BERD 107A to the T1 circuit
Connect a cable from the RX jack to the span-side DSX-1 MON jack.

Press the RESTART switch

7. **Status LEDs**

   Verify these LEDs illuminate: T1 Pulses, Frame Sync, and B8ZS (if applicable).

8. **CATEGORY and RESULTS switches**

   Select the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears. If errors are detected, observe the SUMMARY category results. Check the other categories as required.

9. **Results interpretation**

   VIOLATIONS only

   These errors typically indicate a local T1 span problem caused by a bad splice, crosstalk, water on the cable, or defective DSX jacks.

   FRM ERRORS (CRC ERRORS if ESF framing)

   These errors typically indicate the problem is between you and the last piece of transmission equipment that framed the signal. BPVs are corrected by most transmission equipment.

   RX FREQ, Hz

   The DS1 received frequency should be 1.544 MHz ±77 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

RX LEVEL (dBdsx)

The received level should be -20 dBdsx ±3.5 dBdsx at resistor isolated DSX-1 MON jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

Yellow Alarm LED

The far end sends a Yellow Alarm to indicate that it is not receiving a T1 signal. This alarm indicates that the transmission leg is bad.

10. **Remove the test cable from the DSX-1 MON jack**

SMART NIU TESTING

Smart NIU Testing

12. SMART NIU TESTING
Enhanced ESF Option Required

- Queries a Westell NIU/Performance Monitor for ESF Circuit performance history.

Figure 11 illustrates the T-BERD 107A testing a T1 span that is looped back at the NIU.

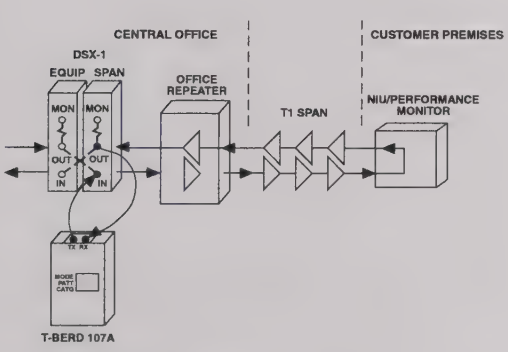


Figure 11
Smart NIU Testing Setup

1. **Configure the T-BERD 107A switches:**

POWER	ON
MODE	T1 ESF
PATTERN	3 IN 24
CATEGORY	SUMMARY
RCVD	INTERNAL (LED OFF)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	TERM
LBO	0

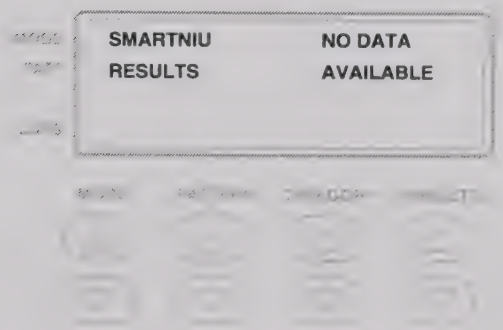
2. **AUX switch**
   Press to illuminate the LED.

3. **PATTERN switch**
   Select the AUX TIME TST function. Press the **RESULTS** switch to select CONTINUOUS.

4. **AUX switch**
   Press to extinguish the LED.

5. **Connect the T-BERD 107A to the T1 circuit**
   Connect a cable from the RX jack to the span-side (EAST) DSX-1 OUT jack. Connect a cable from the TX jack to the span-side (EAST) DSX-1 IN jack (see Figure 12).

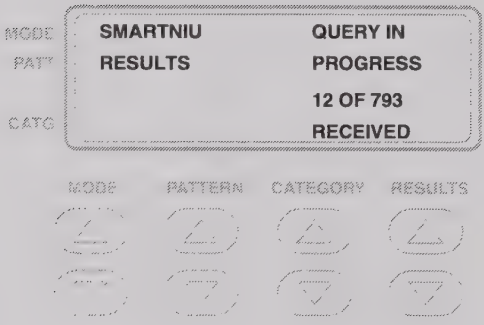
6. **MODE switch**
   Select the SMARTNIU mode.



Press the RESTART switch to activate the Query function

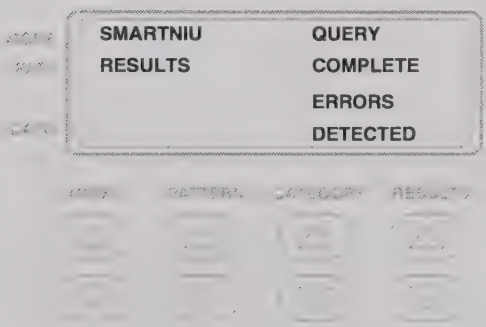
8. **Monitor retrieval process**

Observe the RESULTS display and verify the Query function is proceeding satisfactorily.

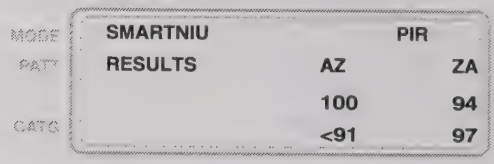


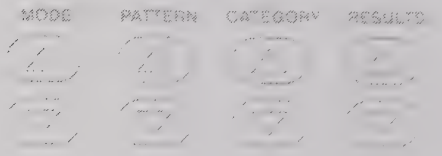
9. **Results interpretation**

Observe the RESULTS display and verify the Query function is completed.



If there are any errors, press the **RESULTS** switch to display the PIR results.





9. **Printout the SMARTNIU Report**
   Press the **PRINT** switch to printout the SMARTNIU Report.

10. **Disconnect the T-BERD 107A from the span**

INTELLIGENT NETWORK TESTING

Testing Intelligent Repeater Spans

13. TESTING INTELLIGENT REPEATER SPANS

Intelligent Network Support Option Required

- Sectionalize intelligent repeater spans by transmitting appropriate loop codes from the central office.

Figure 12 illustrates the T-BERD 107A connected at a DSX-1 access point to sectionalize an intelligent repeater span.

1. **Configure the T-BERD 107A switches:**

POWER	ON
MODE	Select appropriate T1 framing (intelligent repeater loop-up and loop-down codes must be sent in a framed T1 signal)
PATTERN	Select the appropriate test pattern
CATEGORY	SUMMARY
RCVD	INTERNAL (LED OFF)
B8ZS	B8ZS (LED ON), if appropriate
RX INPUT	TERM
LBO	0
LOOP CODES	PROG

2. **AUX and PATTERN switches**

   Press the **AUX** switch to illuminate the LED. Press the **PATTERN** switch to select the AUX SMARTNET function.

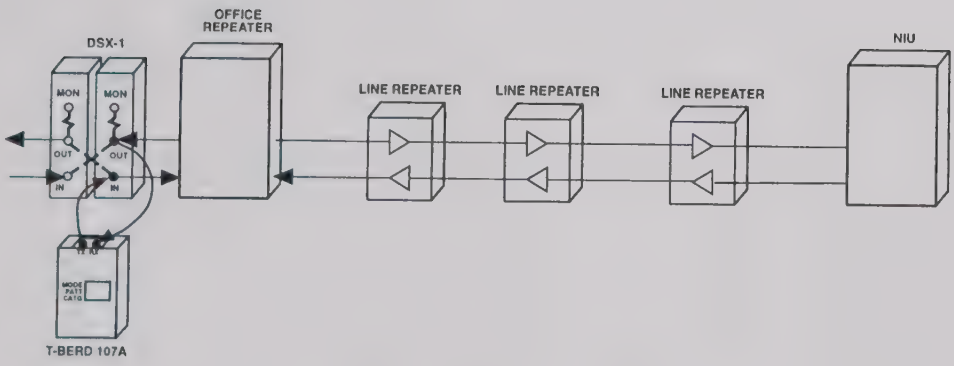
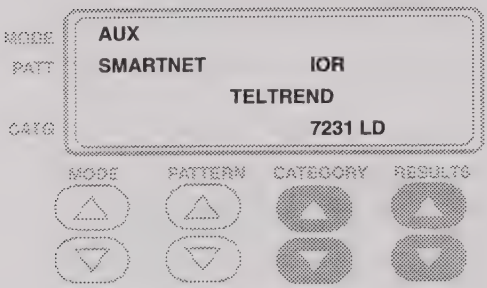


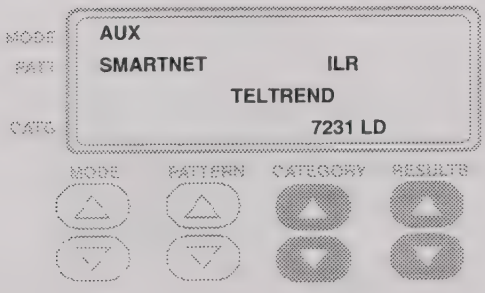
Figure 12
Testing Intelligent Repeater Spans

3. **CATEGORY and RESULTS switches**

Press the **CATEGORY** switch to select IOR. Press the **RESULTS** switch to select the manufacturer and model. If there is no office repeater, select NONE.



Press the **CATEGORY** switch to select ILR. Press the **RESULTS** switch to select the manufacturer and model.



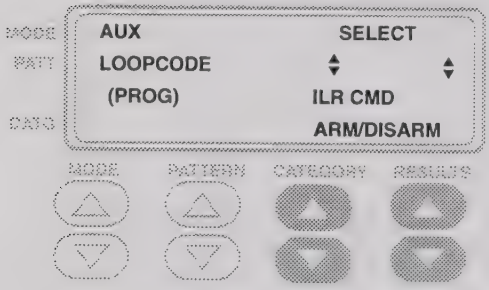
4. **PATTERN switch**

Press the **PATTERN** switch to select the AUX LOOPCODE (PROG) function.

5. **Select arming/disarming code**

   If the span is composed of XEL repeaters, go to Step 17.

   If the intelligent repeater is a Westell 3130-56, a Westell 3150-56, or any Teltrend model, press the **CATEGORY** switch to select ILR CMD. Press the **RESULTS** switch to select ARM/DISARM.



6. **AUX switch**

   Press to extinguish the LED.

7. **Connect the T-BERD 107A to the T1 circuit**

   Connect a cable from the RX jack to the span-side (EAST) DSX-1 OUT jack. Connect a cable from the TX jack to the span-side (EAST) DSX-1 IN jack (see Figure 12).

8. **LOOP UP switch**

   Press this switch to send the arming/NIU loop-up code. The switch LED illuminates until the loop code is detected. This arms the span's intelligent repeaters and provides a loopback at the NIU.

If the switch LED remains illuminated, the span problem may be preventing the loop code from reaching the NIU or returning to the T-BERD 107A. Go to the *Intelligent Repeater Span Sectionalization* procedure and attempt to loop up the mid-span intelligent repeater.

9. **Press the RESTART switch to clear spurious alarms**

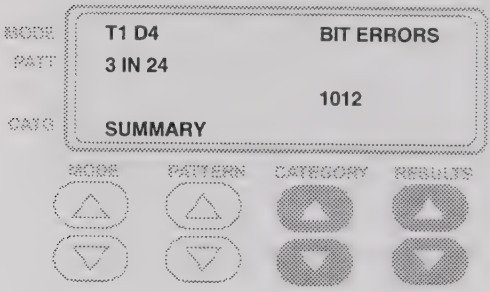
10. **Status LEDs**

When the NIU loopback is established, these LEDs should illuminate: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS (if applicable).

11. **CATEGORY and RESULTS switches**

Check the SUMMARY category. If errors are not detected, *ALL RESULTS OK* appears, and no further testing of the span is necessary. Go to the *Disconnect the T-BERD 107A* procedure.

If errors are detected, scroll through the SUMMARY category for specific errors. Check the other categories as required. Record the types of errors to determine the symptoms of the span problem.



12. **Symptoms identification**

VIOLATIONS only

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a span line problem between you and the last piece of transmission equipment that framed the signal.

VIOLATIONS and FRM ERRORS (CRC ERRORS if ESF framing)

These errors typically indicate a local T1 span problem caused by a bad splice, water on the cable, crosstalk, or defective DSX jacks.

RX FREQ, Hz

The DS1 received frequency should be 1.544 MHz ±77 Hz. If the frequency is out-of-specification, check the transmission equipment timing or the network synchronization.

RX LEVEL (dBdsx)

The received level should be -20 dBdsx ±3.5 dBdsx at resistor isolated DSX-1 MON jacks. Incorrect levels could be caused by a faulty T1 line card or poor cabling between the DSX jack and the equipment.

Yellow Alarm LED

This alarm LED indicates a problem in the transmission leg of the span. Some intelligent network equipment loop codes may cause the Yellow Alarm LED to illuminate briefly while the code is being received.

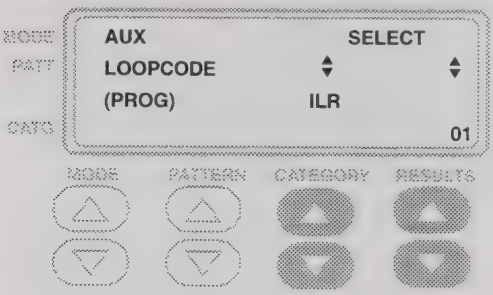
AIS LED

An Alarm Indication Signal (AIS) indicates equipment in the signal path is not receiving the T1 signal from the far end.

Intelligent Repeater Span Sectionalization

1. **AUX and PATTERN switches**
   Press the **AUX** switch to illuminate the LED. Press the **PATTERN** switch to select the AUX LOOPCODE (PROG) function.

2. **CATEGORY and RESULTS switches**
   Press the **CATEGORY** switch to select ILR. Press the **RESULTS** switch to set the address for the mid-span repeater.



3. **AUX switch**

   Press to extinguish the LED.

4. **LOOP UP switch**

   Press this switch to send the intelligent repeater loop-up code to the mid-span repeater. The switch LED illuminates until the loop code is detected. This loops back the signal at the mid-span intelligent repeater.

   If the switch LED remains illuminated, the span problem may be preventing the loop code from reaching the mid-span intelligent repeater or from returning to the T-BERD 107A. Go to Step 8 and select a repeater closer to the CO.

5. **Status LEDs verification**

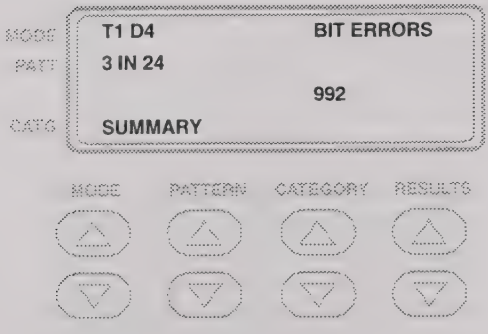
   These LEDs should illuminate: T1 Pulses, Pattern Sync, Frame Sync, and B8ZS (if applicable).

   NOTE If testing will take longer than 30 minutes on a Westell model 3130-56 office repeater, a Westell model 3150-56 line repeater, a

Westell model 3150-56 line repeater, or any Teltrend line repeater, you need to activate the timeout disable feature. Select the AUX LOOPCODE (PROG) function, press the **CATEGORY** switch to select IR COMMAND, and press the **RESULTS** switch to select TIMEOUT DISABLE. Exit the auxiliary functions and press the **LOOP UP** switch to send the loop code that disables the automatic timeout feature.

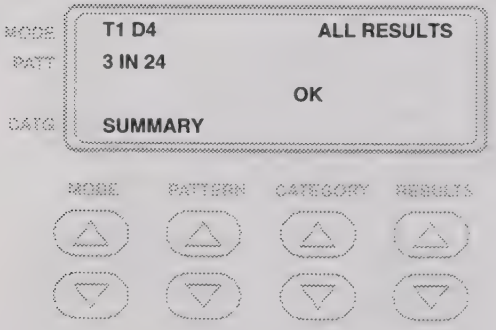
6. **Results interpretation**

Check the SUMMARY category. If the identified symptoms are detected, the problem is between the Central Office (CO) and the looped-back mid-span repeater.



If the T-BERD 107A was unable to loop back the signal at the addressed repeater, the span problem is probably between the CO and the addressed repeater. The span problem could be blocking the loop codes.

If the message *ALL RESULTS OK* is displayed and no Alarm LEDs are illuminated, the problem is between the looped-back mid-span repeater and the customer premises.



7. **LOOP DOWN switch**

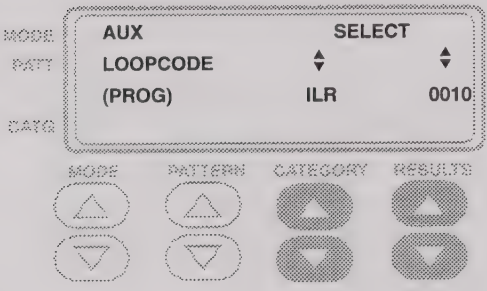
   Press this switch to send the intelligent repeater loop-down code to the mid-span repeater.

8. **Determine new intelligent repeater address**

   Select a new intelligent repeater to be looped back based on the results in Step 6.

9. **AUX, PATTERN, CATEGORY, and RESULTS switches**

   Select the AUX LOOPCODE (PROG) function. Set the ILR address to match the selected intelligent repeater.



10. **AUX switch**

    Press to extinguish the LED.

11. **LOOP UP switch**

    Press this switch to send the intelligent repeater loop-up code to the selected repeater. The switch LED illuminates until the loop code is detected.

    If the T-BERD 107A was unable to loop back the signal at the addressed repeater, the span problem is probably between the CO and the addressed repeater. The span problem could be blocking the loop codes. Return to Step 7.

12. **Results interpretation**

If the looped-back repeater is closer to the CO and errors are still detected, the problem is between the Central Office (CO) and the looped-back repeater. If the looped-back repeater is closer to the CO and no errors are detected, the problem is between the two looped-back repeaters.

If the looped-back repeater is closer to the customer premises and errors are detected, the problem is between the two looped-back repeaters. If the looped-back repeater is closer to the customer premises and no errors are detected, the problem is between the looped-back repeater and the customer premises.

13. **Repeat steps until problem is isolated**

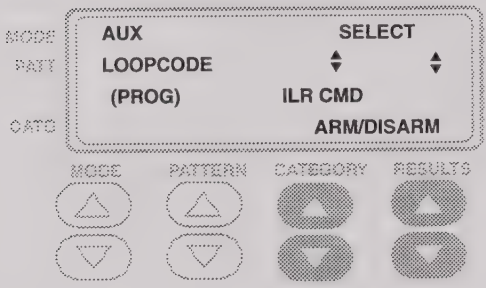
Repeat Steps 7 through 12 until the problem's location has been isolated between two or three repeaters. Now the problem's exact location can be determined by accessing only one or two repeater housings.

14. **LOOP DOWN switch**

Press this switch to loop down the intelligent repeater.

Disconnect the T-BERD 107A

1. **AUX, PATTERN, and RESULTS switches**
   Select AUX LOOPCODE (PROG) to set the appropriate arming/disarming code.



2. **AUX switch**
   Exit the auxiliary function.

3. **LOOP DOWN switch**
   Press this switch to send the disarming/ NIU loop-down code. The switch LED illuminates until the loopback is released.

4. **Disconnect the T-BERD 107A from the span.**

APPENDIX A

Channel Time Slot Assignments

CHANNEL TIME SLOT ASSIGNMENTS

This appendix features a table of channel time slot assignments for all T1 framing formats offered by the T-BERD 107A.

A.1 CHANNEL TIME SLOT ASSIGNMENTS

The channel time slot assignments determine which channel is actually dropped from a framed signal when a particular time slot is selected. Since the T-BERD 107A selects the dropped channel based on the primary usage of D4 and ESF framing, the time slots for other D1D and SLC framing drop different data channels than the user may expect. Use Table A-1 to determine the correspondence between the selected channel number and the actual channel that is displayed.

Table A-1
Channel Time Slot Assignments

Time Slot	D1D Channel Number	D4 & ESF Channel Number	SLC Channel Number
1	1	1	1
2	13	2	13
3	2	3	2
4	14	4	14
5	3	5	3
6	15	6	15
7	4	7	4
8	16	8	16
9	5	9	5
10	17	10	17
11	6	11	6
12	18	12	18
13	7	13	7
14	19	14	19
15	8	15	8
16	20	16	20
17	9	17	9
18	21	18	21
19	10	19	10
20	22	20	22
21	11	21	11
22	23	22	23
23	12	23	12
24	24	24	24

APPENDIX B

Trunk Type Summary

TRUNK TYPE SUMMARY

STD (E&M)				
Tx ON HOOK	A=0	B=0	C=0	D=0
Tx OFF HOOK	A=1	B=1	C=1	D=1
Rx ON HOOK	A=0	B=X	C=0	D=X
Rx OFF HOOK	A=1	B=X	C=1	D=X

FXS (TX) FXO (RX) Ground Start				
ON HOOK	A=0	B=1	C=0	D=1
Ground on ring	A=0	B=0	C=0	D=0
OFF HOOK (Ground on tip)	A=1	B=1	C=1	D=1

FXS (RX) FXO (TX) Ground Start				
ON HOOK (No tip ground)	A=1	B=X	C=1	D=X
OFF HOOK (Ground on tip)	A=0	B=1	C=0	D=1
RINGING	A=0	B=0	C=0	D=0

SLC STAT (TX) SLC OFF (RX) Ground Start		
ON HOOK	A=0	B=0
Ground on ring	A=0	B=1
OFF HOOK (Ground on tip)	A=1	B=0

ESF				
ON HOOK	A=0	B=0	C=0	D=0
Ground on ring	A=0	B=1	C=0	D=1
OFF HOOK (Ground on tip)	A=1	B=0	C=1	D=0

TRUNK TYPE SUMMARY (Continued)

SLC STAT (RX)	**SLC OFF (TX)**	**Ground Start**		
ON HOOK	A=0	B=0		
OFF HOOK	A=0	B=0/1		
(No tip ground)				
RINGING	A=1	B=1/0		
ESF				
ON HOOK	A=0	B=0	C=0	D=0
OFF HOOK	A=0	B=1	C=0	D=0
(No tip ground)				
RINGING	A=1	B=1	C=1	D=0
FXS (TX)	**FXO (RX)**	**Loop Start**		
ON HOOK	A=0	B=1	C=0	D=1
OFF HOOK	A=1	B=1	C=1	D=1
FXS (RX)	**FXO (TX)**	**Loop Start**		
IDLE	A=0	B=1	C=0	D=1
RINGING	A=0	B=0	C=0	D=0
SLC STAT (TX)	**SLC OFF (RX)**	**Loop Start**		
ON HOOK	A=0	B=0		
OFF HOOK	A=1	B=0		
ESF				
ON HOOK	A=0	B=0	C=0	D=0
OFF HOOK	A=1	B=0	C=1	D=0
SLC STAT (RX)	**SLC OFF (TX)**	**Loop Start**		
IDLE	A=1	B=1		
RINGING	A=1	B=1/0		
ESF				
ON HOOK	A=1	B=1	C=1	D=1
OFF HOOK	A=1	B=1	C=1	D=0

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